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ABSTRACT

Like a table of contents in print material, a computer-presented menu presents information. It informs a user of the topics that are available. Some menus present information by categories and thus communicate the organization as well as the content of the program. In addition to providing information, menus serve as a selection and retrieval mechanism, enabling viewers to select an item and have it automatically retrieved by the program. Commercial computer software packages often have pull-down menus. Categories of options are listed across the top of the display screen in a "menu bar." Static menus present a list of items that occupies the entire display. When a user selects a menu item the screen is erased and a submenu appears on an entirely new display. Selection mechanisms include typing numbers or letters corresponding with the desired choice, and moving the cursor, mouse, or space bar. The success of selection mechanisms depends on the typing skills of the intended users, nature of the task, and available equipment. Menu items may be sequenced in a number of ways depending on the subject matter, frequency of use, importance, and convenience. Words used in the menu should be informative, yet brief, and include titles as well as directions for use. Generally, between four and eight items should be presented on a single menu. (6 references) (DB)

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MENUS IN COMPUTER-ASSISTED INSTRUCTION

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Like a table of contents in print material, a computer-presented menu presents information. It informs a user of the topics that are available. Some menus present information by categories and thus communicate the organization as well as the content of the program. But computer-presented menus do more than provide information. They also serve as a selection and retrieval mechanism. They enable viewers to select an item and to have it automatically retrieved by the program. In this sense a computer menu is different from a table of contents in print material, which tells users where to find information but does not retrieve it.

PULL-DOWN AND STATIC MENUS

Most research studies that are concerned with menus address user interfaces for software such as word processors and data entry and retrieval systems. They are concerned with speed as well as ease of communication. Few studies address the issues of menus for computer courseware. The discussion in this manuscript draws on relevant research and practical experience in both domains.

Commercial software packages such as word processors or outliners often have pull-down (also called pop-up) menus. Categories of options are listed across the top of the display screen in a "menu bar." A user selects an option and then by pressing a designated key views all of the items available under it. For example, a menu bar might include categories such as File operations, Print, and Display. When the user selects a menu item a submenu appears on the same display, next to or below the selected item. A user can readily move from one item on the menu bar to another to see the related submenus.

Static menus are different in that they present a list of items that occupies an entire display. When a user selects a menu item the screen is erased and a submenu appears on an entirely new display. The initial list of items is no longer available.

The major advantage of pull-down menus is that a user can easily inspect all of the options that are available. This is particularly useful in programs that provide numerous options such as a menu bar with as many as 10 items, each of which has 6 to 10 items in its submenu. It is probably faster and conceptually easier to use pull-down menus than static in such cases, although no research exists to support this hypothesis.

For some tasks, such as entering and retrieving data, speed is very important so pull-down are preferable to static menus. This is not necessarily true of computer-assisted instruction, where the number of times users need to access the menu is generally not very great. Thus, for computer-assisted instruction static menus may be perfectly adequate. In any case, they are the subject of discussion in this manuscript.

It should be noted that some of the guidelines presented here for menus are also applicable to questions. For example, a comparison of various selection mechanisms is

relevant to selection of mechanisms for responding to multiple choice questions.

SELECTION MECHANISMS

Types Of Mechanisms

Several selection mechanisms are available for static menus. Items can simply be numbered and retrieved by typing a number.

1. Review of main ideas
2. Practice exercises
etc.

Items can be identified with letters, alphabetically, rather than with numbers:

a. Review of main ideas
b. Practice exercises
etc.

Items can also be lettered mnemonically, using the initial letter of the first word as the retrieval cue.

(R)eview of main ideas
(P)ractice exercises

Sometimes users hold a key down a bit too long, so the computer program assumes that the user wished to press the same key twice. When submenus are involved, this may result in retrieval of information the user did not want. For instance a user may want to select Item 2 on the main menu and Item 1 on the submenu, but the program assumes he or she wanted Item 2 on both menus. It is possible to avoid such problems by alternating selection mechanisms on menus and submenus. For instance, one might use a numeric mechanism on the main menu and an alphabetic mechanism on the submenu.

Alternatively, users can be asked to point to the desired item. This is accomplished by pointing with a device such as a mouse or by moving a cursor or pressing a single key such as the space bar to cycle through the items.

Comparison Of Mechanisms

Each of these selection mechanisms has advantages and disadvantages. Numbering has the advantage that numbers are easy to find on the keyboard. The disadvantages are that it is easy for a finger to slip and press the wrong number. If there are more than nine items on the menu (more about the length of menus later) two key presses are necessary. Letters have the advantage that 26 single key presses are available. The major disadvantage of letters is that they are scattered on the keyboard and not as easily accessed by nontypists. Mnemonic lettering is useful as a shortcut for repeated uses of a lesson. However, more than one item may have the same initial letter in the first word, necessitating two-letter mnemonics, hence two keypresses.

Selection by pointing, as with a mouse, requires no typing skill. The disadvantage is that some of the intended users may not have a mouse. Selection by cursor or space bar do not require typing skill either. However, if a cursor or

space bar is the selection mechanism, more than one keypress is required. First a key must be pressed until the desired item is located and then another key (e.g., ENTER) must be pressed to communicate that information to the computer program.

If a menu is a long list of lessons, and the author wishes to present as much information on one display as possible, numbering the items might be the most suitable retrieval mechanism. A user can simply glance through the list and type a number rather than cycle through the entire list with a cursor. If the number of items is short, say no more than five or six items, there is probably no optimal selection mechanism.

Thus the decision about which selection mechanism to choose is a function of the interaction of several factors: the typing skills of the intended users, the nature of the task (e.g. long index of lessons or short index of topics), and the equipment that is likely to be available.

SEQUENCE OF ITEMS

Items can be sequenced in a number of different ways. The decision about how to sequence them is a function of the subject matter and the probability that users will access the lesson many times. If the menu items list topics of study that are sequential in nature, the most reasonable decision is to list the topics in sequential order. For example, in a lesson about fractions, one would list the topic, "Meaning of fractions," before "Addition of fractions." If seqeunce is not relevant, items might be listed in order of importance, or in order of frequency of use. Menu items might be grouped by categories and categories presented alphabetically. The sequence should be one that is most convenient for the users and the task at hand.

WORDING

Words that are used for the menu title and for the menu items should be informative, yet brief. If a lesson is a drill on addition of fractions, the title "Addition of Fractions Drill," is more informative than "Fractions." Titles such as "Main Menu" or "Options" are not very enlightening.

Menus should be explicit about what users will see for each item they select. For example, a menu such as

1. Compound sentences 1
2. Compound sentences 2

is not very informative. However,

1. Compound sentences, comma and conjunction
2. Compund sentences, semicolons

is far more descriptive.

Title

All menus should have a title. The title might be, for example, "Past Tense in French" or "Index of Inorganic Chemistry Lessons."

Directions

Experienced computer users can generally figure out how to use a menu without directions. But not everybody is an experienced user. Therefore, it is important to provide information about how to select an item. For example, a numbered menu might state, "Select an item. Type its number." If a menu requires cursor movement, the user needs to be informed about how to move the cursor. The directions might state, for example, "Use the up and down arrow keys to move the cursor to the item you want. Then press ENTER."

Directions should not be numbered if menu items are numbered. Experience has shown that in such cases users think that they are supposed to type the numbers of the directions.

Feedback

It is important to provide error feedback. For example, if there are only four numbered items and the user presses a number greater than four, say five, the user should be told to select a number from 1 through 4. Consistency in placement of error feedback is also strongly recommended.

Number of items

There are no hard and fast rules about the maximum number of items that should be presented on a menu. In general, the literature suggests no more than four to eight on a single display.

Of course there are some exceptions. A menu may include a long list of items such as an index of lessons that will have to occupy more than one display. In such cases it is important to transmit this information to the user. Two suggestions for doing so are presented here. One is to indicate at the top right hand corner that this is Page n of x, say Page 1 of 3. Another way to indicate that there is more than one page is to add a comment at the bottom of the display stating "Press ENTER for more items." Redundant information is also acceptable.

The number of items on a menu and the number of submenus are often referred to as the breadth and depth of a menu, respectively. Are there any rules about the breadth and depth of menus? Research indicates that users find broad rather than deep menus are easiest to use. For example, eight items, on each of two levels (submenus) is better than two items on each of six levels. This is probably due to the fact that a user can get a better grasp of the entire organization of the content from the former rather than the latter.

MANAGEMENT OF MENU SYSTEM

Menus and submenus can be traversed as a linear sequence only, or as a linear sequence with shortcut options. If the path is strictly linear, a person moves from the main menu to a submenu and then to other submenus beneath it. To get back to the initial menu, a user moves backward through the succession of submenus. In some instances users find it convenient to get back to the initial menu directly from any submenu. An alternative structure is to allow users the additional option of shortcutting the linear path and going directly back to the main menu.

GENERAL RULE

The purpose of a menu is to provide information and to make retrieval as simple and efficient as possible for the intended users. Decisions about the design of a menu - selections mechanisms, sequence, wording, layout, and structure - should take into account the characteristics of the users, the nature of the task, and the kind of equipment the intended users are likely to have.

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